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A Preliminary Study on the Immobilization of the Asiatic Elephant *(Elephas maximus)* Utilizing Etorphine (M-99)

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(Plates I-II)

A preliminary study of M-99 for the immobilization of the Ceylonese elephant indicates the effective dosage is approximately twice that used in the African elephant, based on comparative body weights. A dosage rate of 7 to 8 mgs of M-99 was necessary to immobilize the Ceylonese elephant as compared to 5 or 6 mgs of M-99 for African elephants of almost double the weight.

Introduction

In 1966 a survey of Ceylon's elephant population was formally launched by the Office of Ecology and the National Zoological Park of the Smithsonian Institution. Grants for support of this project were awarded to Dr. H. K. Buechner and Dr. J. F. Eisenberg from the Smithsonian Foreign Currency Program and the World Wildlife Fund. As part of the project mission, we were charged with the responsibility of introducing the staff of the Wildlife Department of Ceylon to the use of M-99 as a possible method of tranquilizing elephants involved in crop damage. Utilization of M-99 would allow troublesome animals to be immobilized, tied, and transported to areas for either release in the wild or recruitment into the domestic elephant population which are still employed in lumbering operations in parts of Ceylon.

Since virtually no work had been undertaken previously to test the immobilizing effects of M-99 on the Asiatic elephant, Dr. C. W. Gray went to Ceylon in October 1967 in order to test the effectiveness of the drug, to determine a correct dosage for the Asiatic elephant, and to instruct personnel of the Wildlife Department of Ceylon in the use of pertinent equipment.

The following report is a summary of six attempted immobilizations on the Ceylon elephant. Our operation commenced on October 13, 1967, at Inginiyagala and terminated on October 22, 1967.

Study Area

The elephant immobilization studies were conducted in the Gal Oya region of eastern Ceylon on the shores of a large tank, or reservoir, formed by an earthen dam. The dam was constructed to provide water power for the generation of electricity and irrigation. The area surrounding the tank (Senanayake Samudra) is heavily wooded and extremely bushy. Every effort was made to locate an elephant in a situation where observation could be continuous from the time of injection until immobilization occurred.

Methods

All personnel were instructed in the assembly of the projectile dart and the handling of the CapChur rifle. Prior to departure from camp, two projectile syringes were prepared, each containing M-99 at a 4 mg dose. The unused darts were emptied at the end of each day in order to eliminate the possibility of product deterioration. Another change in technique was the reconstitution of immobilizing drugs in the field in order to eliminate completely the possibility of product potency loss. This also allowed dosage regulation, depending on the estimated height and weight of the elephant (unpublished data

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obtained through a cooperative study of captive elephants, made in 1967 with the staff and students of the University of Ceylon School of Veterinary Medicine, Kandy, permitted us to determine weight based on the estimated height).

Elephant No. 1

The animal was sighted in the afternoon moving southwest from the lake toward the forest. After a ten-minute stalk, the animal was shot in the left gluteal with a projectile dart containing 4 mg of M-99 in a 1-cc syringe from a distance of 20 yards, using a medium-charge cartridge. This dosage was selected due to its effectiveness in the immobilization of the African elephant as reported by Horthoorn and Bligh in their paper "The Use of a New Oripavine Derivative with Potent Morphine-like Activity for the Restraint of Hoofed Wild Animals" (*Research in Veterinary Science,* vol. 6, no. 3, July 1965). The dart did not stick in the animal and when it was recovered, the needle was bent at a 45° angle. When the elephant was shot, it wheeled, touched the ground with its trunk, picked up a stick, threw it into the air, and entered the brush, where visual contact was lost. The elephant continued moving for 15 minutes, and it was apparent that immobilization was unsuccessful.

Elephant No. 2

This eight-and-one-half-foot male Ceylonese elephant was seen on the lake shore bathing. It left the water and was shot inland with 5 mg of M-99, using a high-powered cartridge from a distance of 30 yards. The syringe was equipped with a heavy-duty needle with a barb. The animal was hit in the gluteal region, turned and entered a small, bushy area 150 yards distant. It made no effort to remove the dart. At 15 minutes after injection, a search was instituted, and the elephant was found leaning with its head against a tree, making paddling movements with the left front foot. There was no response to calling or breaking of small branches. When a larger branch was broken, the elephant turned toward the source of the noise, showing obvious narcosis. At 30 minutes after injection, it had returned to its original position, leaning against the same tree, and again responded to the noise stimulant. At 45 minutes after injection, it did not respond to the breaking of larger branches, but when struck on the trunk with a branch, it wheeled and charged; the tail was lifted but its trunk was limp. When approached at 70 minutes after injection, the elephant moved about ten steps toward the group. It picked up dirt, threw it over its back, indicating a functional trunk; and at this point, observation ceased.

On the following day we tracked the elephant from the same bushy area, over a log and down into the forest about a quarter-mile distant. There was no indication of any impairment of gait.

It should be noted that dosage rates of M-99 were being increased by 1 mg per elephant, in an effort to reach an immobilizing dosage.

Elephant No. 3

A lone male was sighted and stalk was started (Pl. I, fig. 1); the elephant was shot 30 minutes after being sighted. A 7 mg dose of M-99 was loaded into a 5cc projectile syringe, and a high-powered load was used from a distance of 35 yards. The dart bounced off the animal and the needle was bent in the shape of an S. Apparently the dart struck the pelvis rather than a muscle mass. The elephant went into the jungle about one-half mile distant, turned, and crossed an open space one-quarter mile further, and went into dense jungle. No further attempt was made to follow the elephant, and the last observation was made 25 minutes after the attempted injection.

Elephant No. 4

A male elephant, with an estimated height of six and one-half feet and weight of 6,000 pounds, was sighted. By means of a projectile syringe equipped with a heavy-duty needle, a 6 mg dose of M-99 was injected, using a low-powered load from a distance of 15 yards.

The elephant was under constant observation; at seven minutes post injection it sat down in a dog-like attitude, and as it turned, fell recumbent. At ten minutes post injection, the ear moved slowly but the trunk was flaccid. This animal was marked with paint on the right hip and measured. Since it was in direct sun, 12 mg of M-285 was injected intramuscularly into the right gluteal region (Pl. I, fig. 2).

At 20 minutes post injection, 4 mg of M-285 was given intravenously into the ear vein (Pl. II, fig. 3). Initial response was movement of the trunk tip, then ear, and front foot; one minute after the intravenous injection, the ear started to fan and foot movement increased; at four minutes, the head was raised. Activity continued, and at four and one-half minutes, the animal made its first attempt to rise; at five minutes, the hind foot was swinging as a prelude to rising (Pl. II, fig. 4); and at ten minutes, the animal was on all four feet and moving off with no impairment of gait. It was using the tip of its trunk in searching movements until it entered the jungle (Pl. II, fig. 5). No further observation was possible.

Elephant No. 5

A full-grown elephant, with an estimated height of seven and one-half feet and weight of

6,000 pounds, was injected with a 7 mg dose of M-99, using a low-powered charge from a distance of 20 yards. The animal moved about one and one-half miles, collapsed, and became immobile at 16 minutes post injection (the first pedal impediment was noticed at 12 minutes post injection). The head was raised one-half minute following its recumbency but there was no attempt to rise. This elephant was measured and found to be eight and one-half feet tall, making the weight approximately 7,000 pounds (data cited on page 52). It was marked on the right hip and the projectile syringe was removed. At 35 minutes after immobilization, the elephant received 14 mg of M-285 intramuscularly. At 48 minutes after injection, ear movement was noted; at 56 minutes, the elephant got up; and at 60 minutes, it took several steps and sat back down on the hind quarters. At this point it was dark, rain had started, and further observations were not made. Early the following morning, the elephant was seen near the same spot with a normal gait and unimpaired movement and activity.

Elephant No. 6

An eight-and-one-half-foot elephant was injected with an 8 mg dose of M-99, using a heavy-duty needle in the projectile syringe and a medium load, from a distance of 20 yards. Under continuous observation from time of injection, the elephant walked 300 yards and entered the jungle, turned to the left for approximately 25 yards, entered a small open clearing, and went down seven and one-half minutes after injection. Measurement of the animal confirmed the height estimate; it was then marked and the dart was removed. At 23 minutes after injection, the elephant received 16 mg of M-285 intravenously; at 43 minutes, it received 5 mg of M-285. Later it moved by pushing itself in a half-circle, and when it stopped, the elephant had a tree between the front and hind legs. It was able to move its ear, its trunk made searching movements, and it made an effort to rise. A 10 mg dose of M-285 was administered intramuscularly, and the elephant was left lying in the shade. There was a breeze blowing, the elephant's respirations were 9 to 10 per minute and no evidence of cyanosis was seen. Close examination revealed the presence of a perforation in the gluteal region, leading us to believe that this was the same elephant described as No. 2. Darkness prevented further observation, but the animal was seen two miles distant the next morning on the edge of the tank.

Observation

It seems from this limited study that to immobilize the Ceylonese elephant, the requirement of M-99 is approximately twice that for the African elephant, based on comparative body weight. Pienaar, Niekerk, and Young, in their report on the use of oripavine hydrochloride in the drug immobilization and marking of wild elephants in the Kruger National Park in describing the effect of M-99 on 31 bull elephants (*Journal for Scientific Research in the National Parks of South Africa,* No. 9, 1966), indicate an effective dosage level of M-99 combined with acetyl promazine totaling 7 mg or 8 mg for African elephants weighing close to 15,000 pounds, and of 5 mg or 6 mg for elephants weighing from 6,000 to 12,000 pounds.

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EXPLANATION OF PLATES

Plate I

Fig. 1. Elephant stalk in progress. (All photographs by Dr. F. Kurt)

Fig. 2. Intramuscular administration of M-285.

Plate II

Fig. 3. Intravenous injection of M-285 using the ear vein.

Fig. 4. Sitting position immediately prior to regaining feet.

Fig. 5. Elephant now ambulatory showing no evidence of narcosis.

FIG. 1

FIG. 2

A PRELIMINARY STUDY ON THE IMMOBILIZATION OF THE ASIATIC ELEPHANT (ELEPHAS MAXIMUS) UTILIZING ETORPHINE (M-99)

FIG. 3

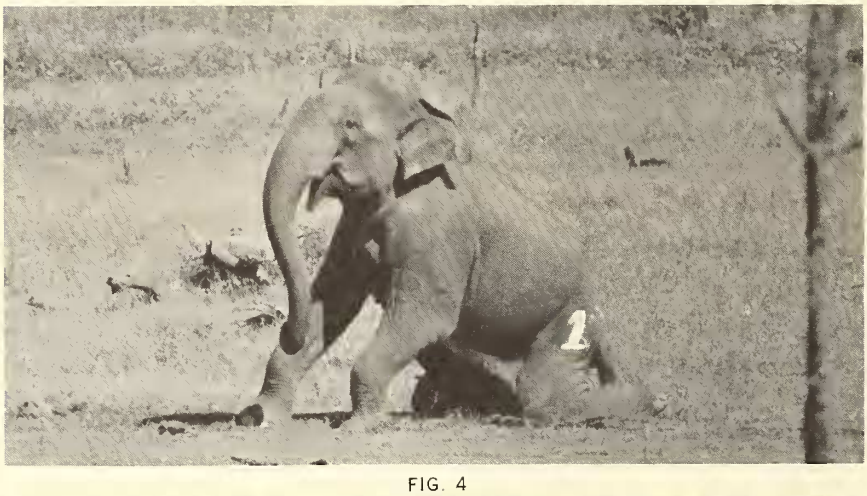

FIG. 4

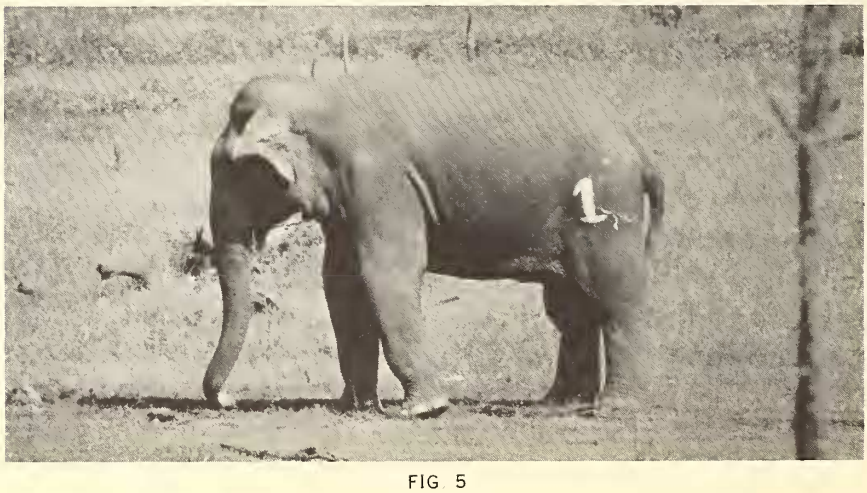

FIG. 5

A PRELIMINARY STUDY ON THE IMMOBILIZATION OF THE ASIATIC ELEPHANT (ELEPHAS MAXIMUS) UTILIZING ETORPHINE (M-99)